

Lake and stream response to alewife restoration at Sedgeunkedunk stream and beyond



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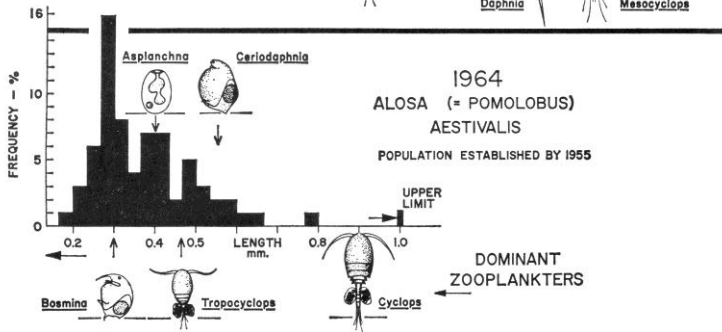
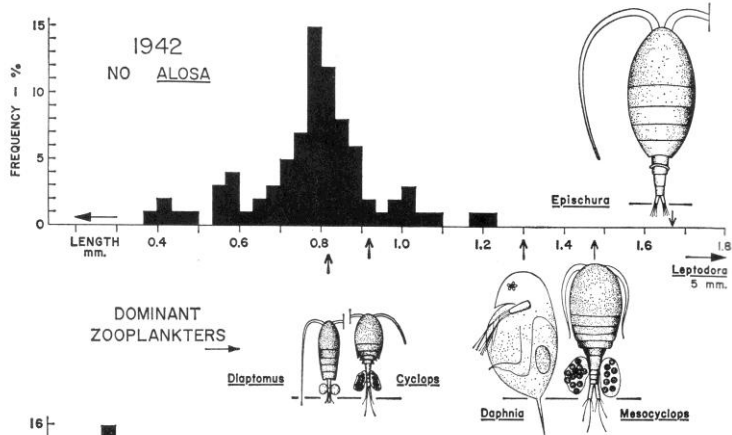
Department of Wildlife Ecology, U. Maine

Rory Saunders

NOAA Maine Field Station

Alewife role in lakes and streams....

Brooks and Dodson 1965



Long term pre- and post-monitoring

BACI with replicate control

Fields – restored

Brewer, Swetts - no access

Alamoosook, Toddy – access

pre = 2008, 2009, 2010

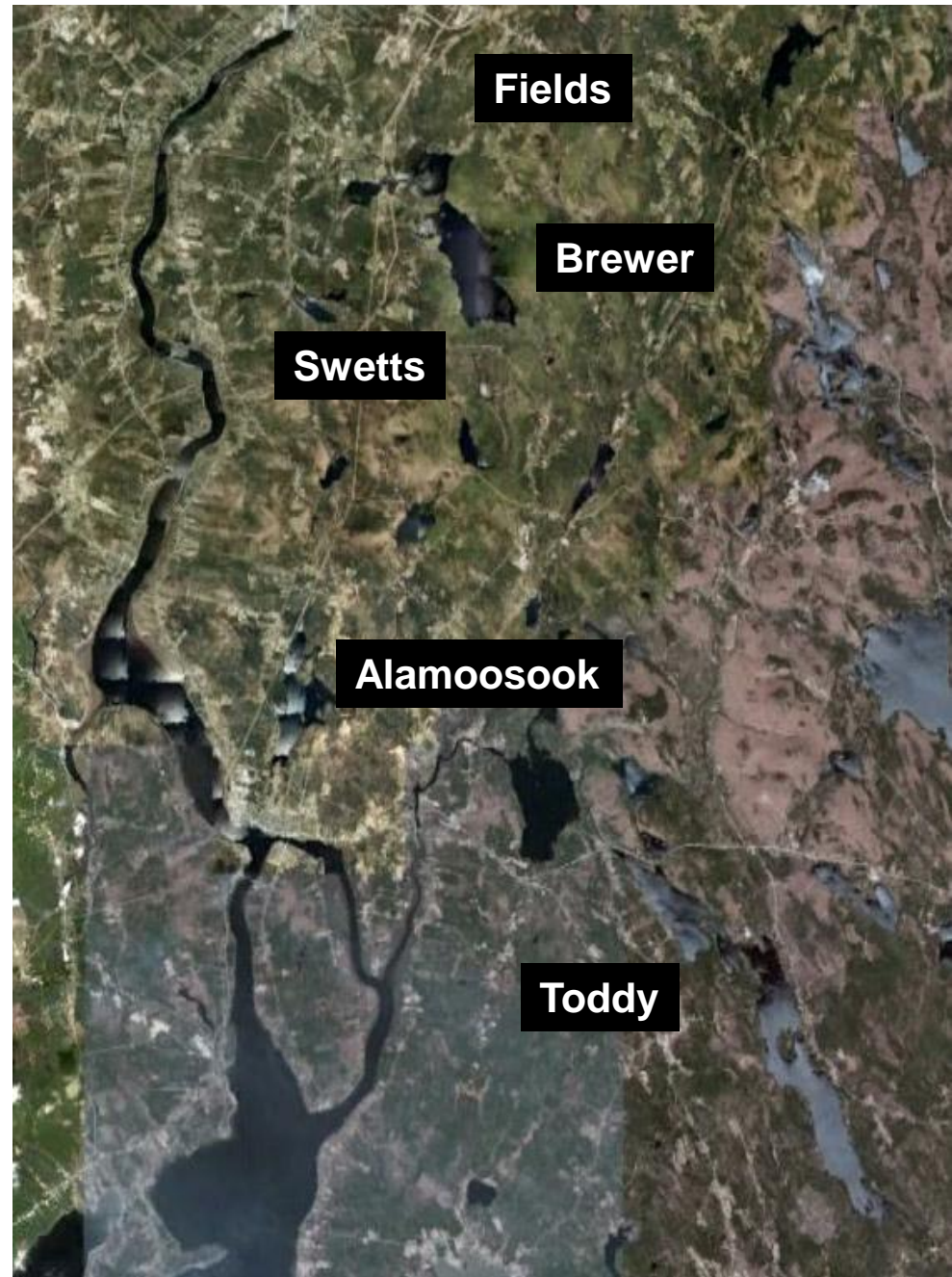
post = 2011+

Bi-weekly ice off to early October

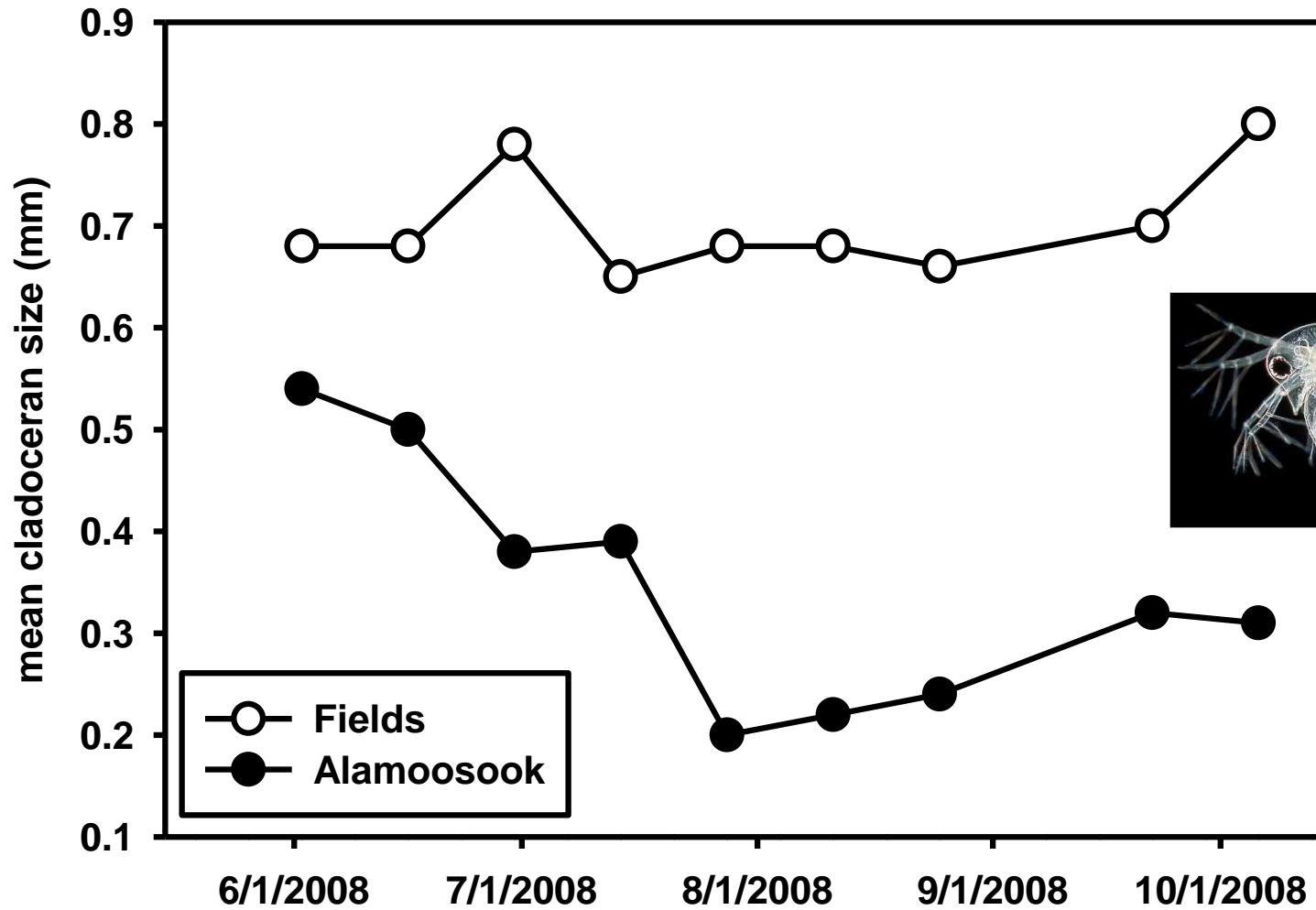
Response variables:

1. zooplankton
size, biomass, community composition
2. phytoplankton
chlorophyll *a*, community composition
3. chemistry
TN, TP, secchi, temperature, DO

Fish – stable isotopes, trap netting



Typical Zooplankton Trends



Alewife effects across trophic gradients...

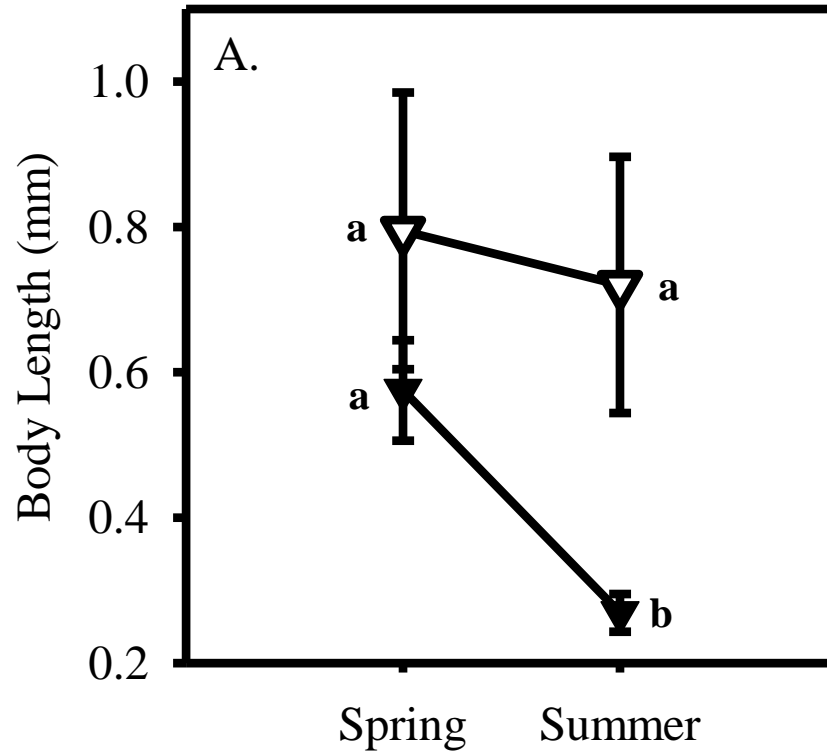
Lake	Area (ha)	Perimeter (m)	Max. Depth (m)	Mean Depth (m)	Volume (m ³)	pH	Conductivity (uS/cm)	TP (ppb)
<i>Alewife</i>								
Alamoosook Lake	403	14820	8.5	4.9	2.0x10 ⁷	7.0	42	5.4
Toddy Pond	975	50344	37.2	8.2	6.2x10 ⁹	6.5	30	1.5
Webber Pond	499	14900	15.2	6.1	2.4x10 ⁷	7.0	61	16.4
Sebasticook Lake	1836	44682	15.2	6.1	1.1x10 ⁸	7.4	103	30.0
<i>Non alewife</i>								
China Lake	1594	49001	26.0	8.5	1.2x10 ⁸	7.1	82	16.4
Fields Pond	210	16178	9.4	4.0	2.4x10 ⁶	6.9	32	4.2
Swetts Pond	50	4260	7.3	3.4	1.1x10 ⁶	6.8	40	15.1
Swan Lake	562	15174	26.5	10.4	5.1x10 ⁷	7.0	34	4.4

Methods

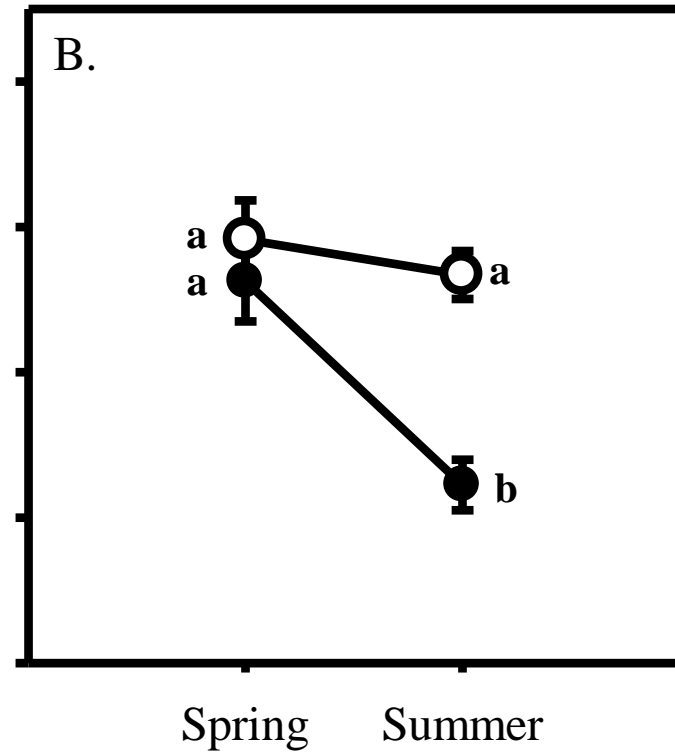
- **Experimental design**
 - **Spring and summer comparisons**
 - Zooplankton: body size, biomass, community composition
 - Phytoplankton: biomass (chlorophyll *a*)
 - **Trophic cascades**
 - Ratio of chlorophyll *a* to zooplankton biomass (Chl*a*:ZB)
 - Large values mean stronger top down effects

Results- Body Size

Cladocerans



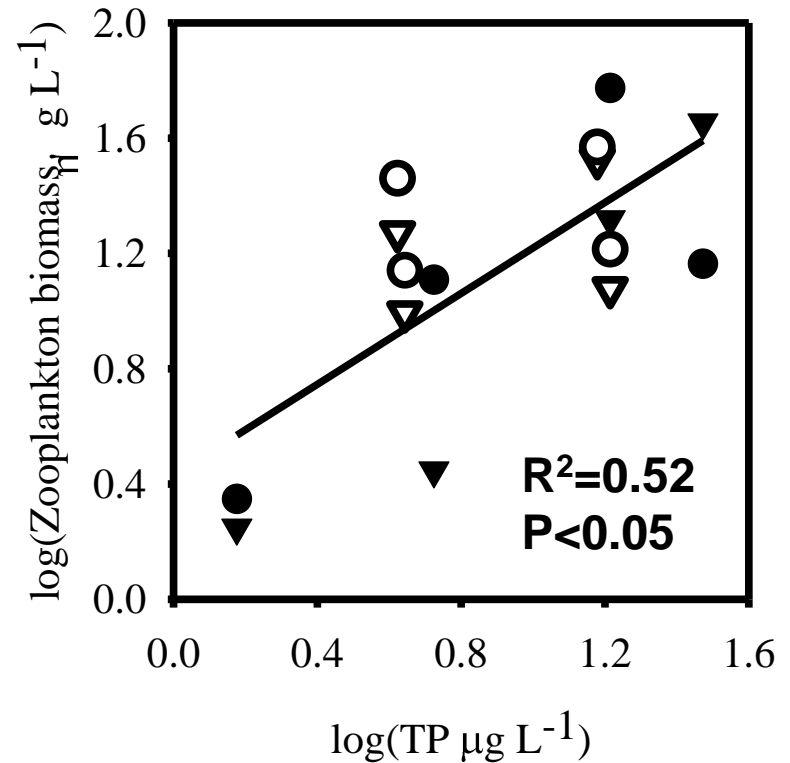
Copepods



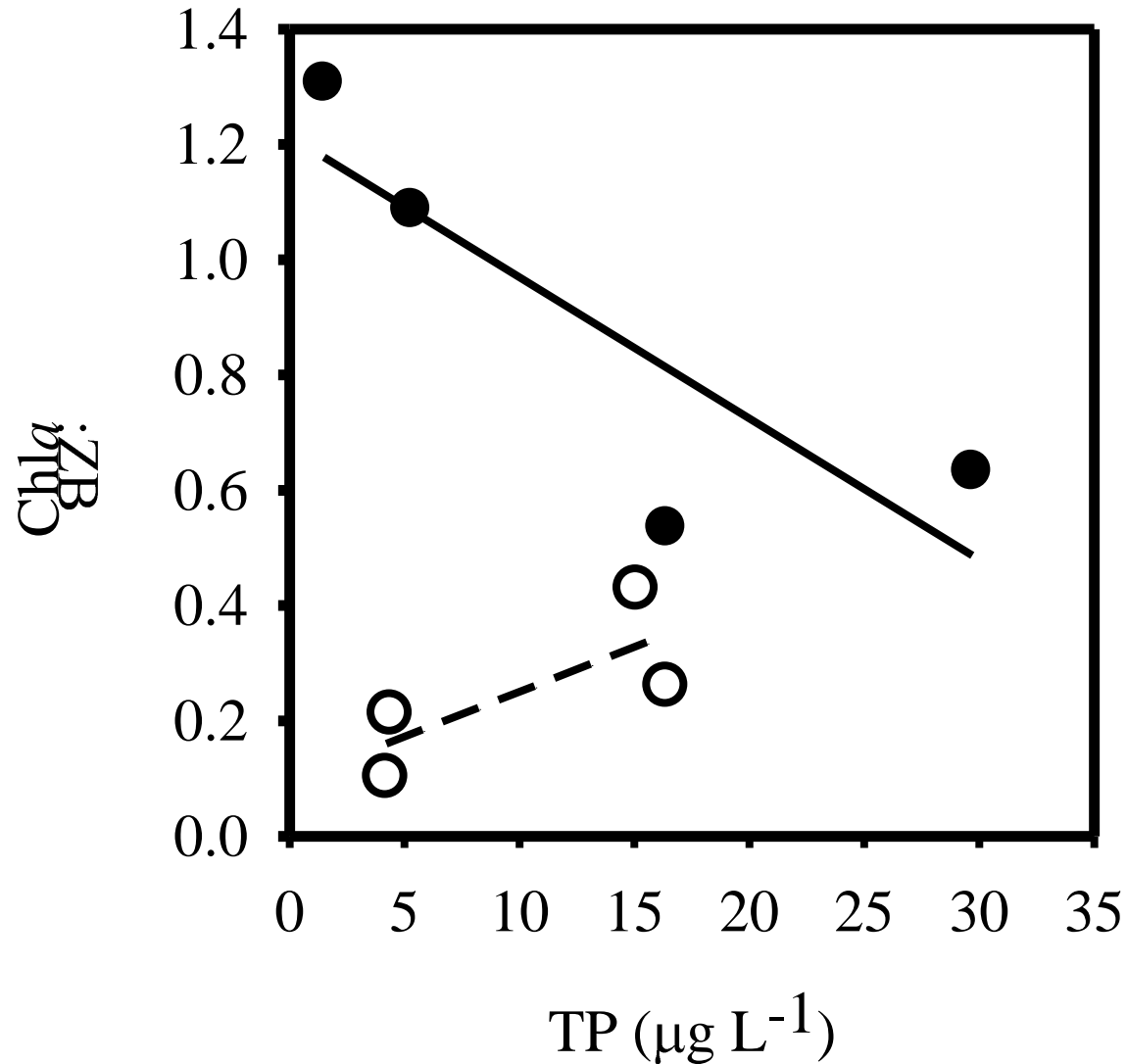
black symbols = alewife

Results- Biomass

- **Total zooplankton biomass increases with TP**
- **Biomass decreases from spring to summer in all lakes, except Sebasticook Lake**

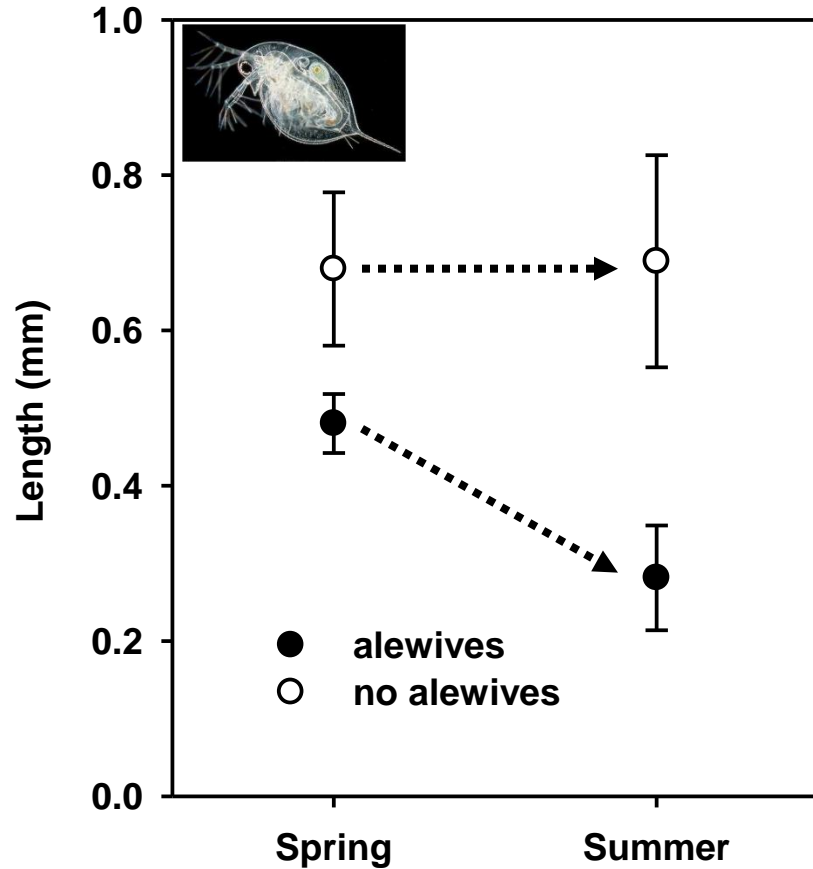


Cascading effects depend on trophic state....



Linking lakes to streams....

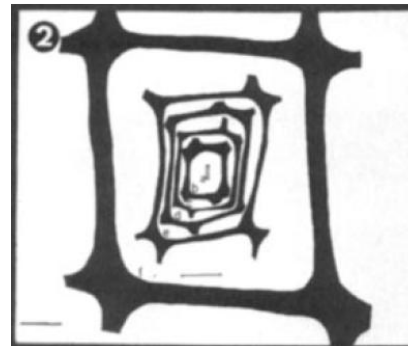
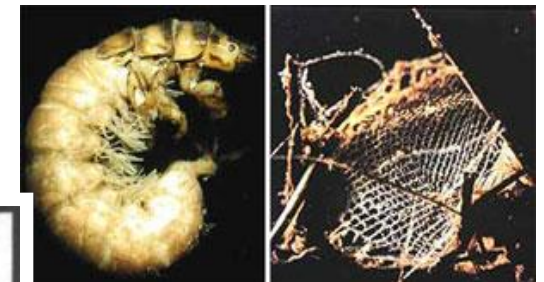
Lake



Particle Export

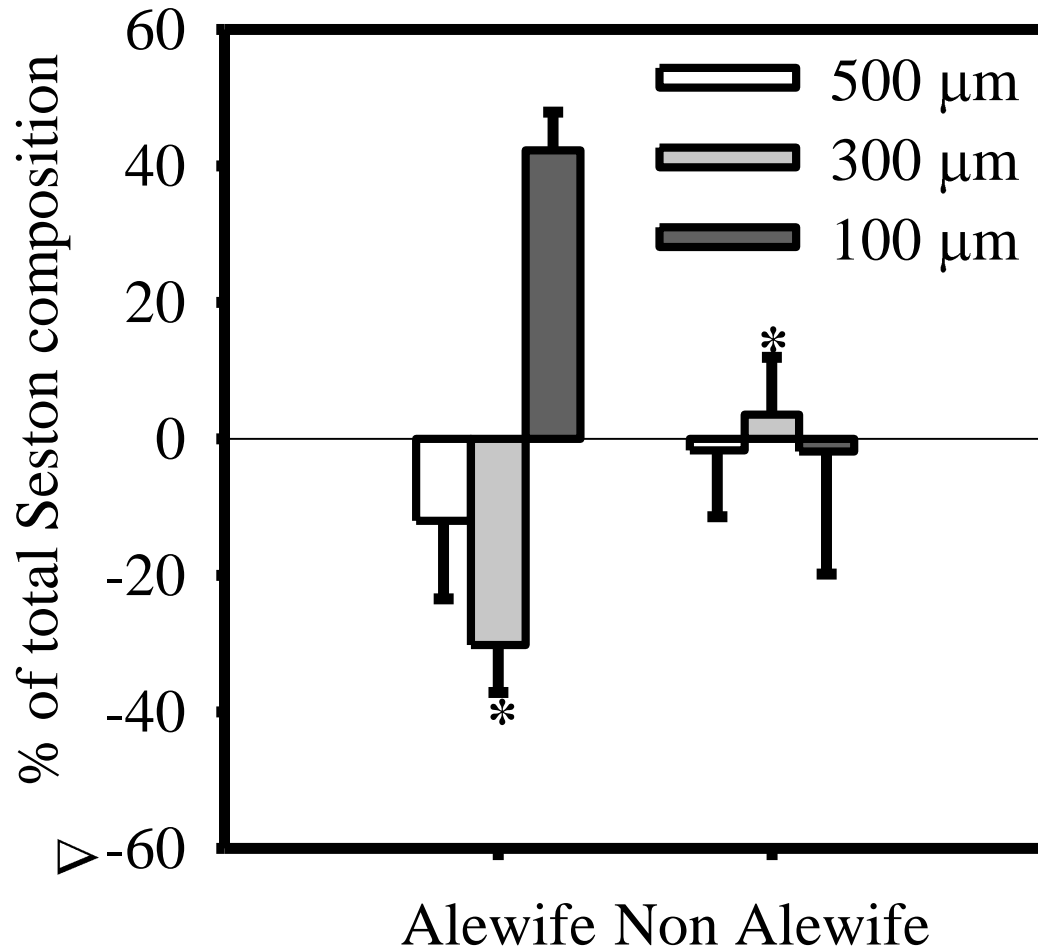
1. Size
2. C:N:P
3. Marine nutrients (^{13}C , ^{15}N , ^{34}S)

Stream



1. Community structure
2. Biomass
3. Size

Seasonal changes in lake export...



What happens when the dams fall?

Outcome likely depends on lake trophic state

Effects will be manifest in both lakes and streams

The stage is set at Sedgeunkedunk stream....

Acknowledgements

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